AF 2155

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| **First Named Inventor** | Cain |
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Response to Notification of Non-Compliant Appeal Brief

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## SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

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| Firm or Individual name | Lindsay G. McGuinness, Reg. No. 38,549<br>Steubing McGuinness & Manaras LLP |
| Signature | Lindsay G McGuinness |
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

| | |
|---|---|
| Applicant(s): Cain<br><br>Application No.: 09/457209<br><br>Filed: 12/8/1999<br><br>Title: System Device and Method for Sending Keep-Alive Messages in a Communications Network<br><br>Attorney Docket No.: 120-025 BA0414 | Art Unit:<br>2155<br><br>Examiner:<br>Zia |



Commissioner for Patents
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Alexandria, VA 22313-1450

RESPONSE TO NOTICE OF NON-COMPLIANT APPEAL BRIEF

Dear Sir:

In response to the Notice of Non-Compliant Appeal Brief, Applicants submit herewith the Appeal Brief in compliant form.

Applicants have made a diligent effort to place the claims in condition for allowance. However, should there remain unresolved issues that require adverse action, it is respectfully requested that the Examiner telephone Lindsay G. McGuinness, Applicants' Attorney at so that such issues may be resolved as expeditiously as possible.

Respectfully Submitted,

4/25/2005
Date

Lindsay G McG

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Docket No 120-025
Dd: 5/15/2005

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APPEAL BRIEF OF BRADLEY CAIN
FOR
SYSTEM, DEVICE, AND METHOD FOR SENDING KEEP-ALIVE MESSAGES IN A COMMUNICATION NETWORK

**Serial No. 09/457,209**
**Filed: December 8, 1999**

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**Appeal from a decision of the Primary Examiner dated June 3, 2003**
**Technology Center 2155**
**Examiner Syed Zia**

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## I. Real Party in Interest

The real party in interest is Nortel Networks, Limited.

## II. Related Appeals and Interferences

Appellants are not aware of any appeals or interferences that are related to the present case.

## III. Status of the Claims

This is an appeal brief from a decision by the Primary Examiner dated June 3, 2003, rejecting claims 1-26, current pending in the present application. No claims have been allowed. Claims 1-26 are the subject of this appeal.

A notice of Appeal was filed on September 30, 2003.

## IV. Status of Amendments

In Office Actions dated July 31, 2002 and January 13, 2003, claims 1 - 24 were rejected under 35 U.S.C. §102(b) as being anticipated by Armstrong, U.S. Patent 5,542,047. On March 10, 2003, Appellants filed a response to the final office action of January 13, 2003. In an advisory action of March 28, 2003, the Examiner indicted that the response would not entered due to amended claims. On April 10, 2003 Appellant submitted a Request for Continued Examination, requesting that the response of Mach 10, 2003 be entered. On June 30, 2003, an office action was received which maintained the rejection of claims 1-26 under 35 U.S.C. §102 as being anticipated by Armstrong. On September 30, 2003 Appellants filed a notice of appeal.

## V. Summary of the Invention

### A. Background

In today's information age, computers and computer peripherals are often inter-networked over a communication network. The communication network includes a number of network nodes that interoperate to route protocol messages within the communication network. These network nodes typically run various routing protocols in order to determine forwarding paths for routing protocol messages within the communication network.

When a network node fails, the other network nodes need to route the protocol messages around the failed network node. The network nodes typically rely on "keep-alive" messages to determine whether a particular network node is operational. Each node periodically sends keep-alive messages to its neighbors. A network node may consider a particular neighbor to be operational so long as the neighbor is sending keep-alive messages.

Therefore, each network node receives keep-alive messages from its neighbors. The processing of keep-alive messages can be computationally intensive, especially if the network node has many neighbors.

### B. Appellants' Invention

In accordance with one aspect of the invention, the a system and device is provided wherein the frequency for sending keep-alive messages to a neighbor is calculated based upon a reliability factor for communicating with the neighbor. A node

calculates a reliability factor for communicating with a neighbor and sets the frequency for sending keep-alive messages .to the neighbor based upon the reliability factor. The reliability factor is determined based upon the reliability of the neighbor as well as the reliability of the communication link to the neighbor. The frequency for sending keep-alive messages to the neighbor is relatively high if the reliability factor is low. The frequency for sending keep-alive messages to the neighbor is relatively low if the reliability factor is high. The frequency for sending keep-alive messages to the neighbor is dynamically adjusted based upon an updated reliability factor.

## VI. Issues

A. Whether claims 1-24 were properly rejected under 35 U.S.C. §102(b) as being unpatentable over Armstrong (U.S. Patent 5,542,047).

## VII. Grouping of Claims

Claims 1-24 do not stand or fall together.

## VIII. Argument

### A. The Examiner has failed to establish under 35 U.S.C. §102(b) that claims 1-26 are anticipated by Armstrong.

The Manual of Patent Examining Procedure states at section 2131: "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). See also MPEP § 2131.02.< "The identical invention must be shown in as complete detail as is contained in the ...

claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989)…" Armstrong fails to teach or suggest every limitation in the claims, and for at least this reason the rejection under 35 U.S.C. §102 is improper.

Armstrong describes a distributed network monitoring system for monitoring node and link status. The exemplary distributed monitoring system distributes the monitor function of determining the status of the nodes and the communication (comm.) links for those nodes. (Armstrong, col. 4, lines 55-57). Armstrong describes the node monitoring function as follows:

> "… When a node is brought on-line, the node monitor software 20 is loaded, and handles all tasks associated with implementing the monitor function for that node. The principal function … is the circulation and maintenance of a circulating status table (CST) – each on-line node receiving the CST writes its status into the CST and reads the status of all other nodes from the CST…" (Armstrong, col. 4 lines 62 – col. 5 lines 2) …
>
> "… The monitor software running in each on-line node is responsible for indicating that a node has changed node status … In the on-line nodes, the node monitor tasks *routinely poll all nodes listed as off-line in the CST… At each on-line node, during regular one minute polling intervals*, the node monitor task transmits a polling packet to each of the off-line nodes between itself and the on-line node… These unsolicited boomerang packets will be received by the packet manager task of the destination node if that node is on-line…" Armstrong col. 9 lines 58 – col. 10 lines 5.
>
> "… Link Status Monitoring … In each node, the node monitor task is responsible for determining link status for the network communications link(s) over which a node will attempt to communicate… This link monitor function is *performed continuously, independent of the operation of the CST server task…* During *regular link monitoring intervals (such as one second),* the node monitor task attempts to communicate over each link to any other on-line node in the system for which that link is operational…"

Accordingly, it would appear that Armstrong describes a link and node monitoring status that regularly and periodically checks node and link status.

The Examiner states, at page 3 of the office action dated June 30, 2003, in response to arguments regarding claim language "… This is not found persuasive. APA teaches and describes system and method for node and link status monitoring for distributed computer

network, and distributing network monitoring among each nodes such that monitor software in each node is responsible for providing status information about node and its communication links. This is accomplished by dispatching a circulating status table (CST) at calculated intervals from a node designated as a dispatching node to other nodes that are on-line. The CST is circulated to each on-line node and then returned to the dispatching node. At each node that receives the CST, selected status information about such node is written into the CST and selected status information is read about the other nodes… As a result, APA does implement a system and method that involves communication system where each node receives keep-alive messages from its neighbors based upon a reliability factor for communicating with a neighbor.. Applicants clearly have failed to explicitly identify specific claim limitations, which would define a patentable distinction over prior arts…"

Appellants disagree, and note that they have repeatedly cited language which they believe distinguishes the claims from the prior art, in particular, the fact that Armstrong fails to teach or describe the steps of "calculating a reliability factor" and "varying the frequency of sending keep-alive messages in response to the calculated .

**1). Claim 1:**

**a). Armstrong fails to teach or suggest the claimed limitation of "periodically calculating a reliability factor for communicating with a neighbor" as recited in claim 1.**

Appellants again submit that Armstrong neither describes nor suggests the step of "*periodically calculating a reliability factor*" as recited in claim 1. In fact, although Armstrong

passes a CST table around, and certain reliability data could be inferred from the receipt of the CST table (or lack of it), there is no mention or suggestion of the steps of '*calculating* a *reliability factor*' as recited in claim 1. It appears that the Examiner has given no patentable weight to either of the terms 'calculating' or 'reliability factor.'

Appellants recognize that "During examination, the claims must be interpreted as broadly as their terms reasonably allow. This means that the words of the claim must be given their plain meaning unless applicant has provided a clear definition in the specification. *In re Zletz*, 893 F.2d 319, 321, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989) *MSM Investments Co. v. Carolwood Corp.*, 259 F.3d 1335, 1339-40, 59 USPQ2d 1856, 1859-60 (Fed. Cir. 2001)..." However, Appellants assert that the Examiner is ignoring the plain meaning of the words 'calculating' and 'reliability factor,' and placing too broad an interpretation on the language. Appellant's note that, during prosecution, Appellants amended the claims to replace the step of 'determining' with 'calculating,' and added the term 'factor', thus giving clear meaning to one of skill in the art that a mathematical calculation is being performed. In the Merriam Webster Dictionary, the term 'calculate' is defined as "...to determine by mathematical processes..." The term 'factor' is defined as "...any of the numbers or symbols in mathematics that when multiplied together form a product; *also* **:** a number or symbol that divides another number or symbol **b :** a quantity by which a given quantity is multiplied or divided in order to indicate a difference in measurement ..." When not defined by applicant in the specification, the words of a claim must be given their plain meaning. In other words, they must be read as they would be interpreted by those of ordinary skill in the art. >*Rexnord Corp. v. Laitram Corp.*, 274 F.3d 1336, 1342, 60 USPQ2d 1851, 1854 (Fed. Cir. 2001); *Toro Co. v. White Consol. Indus., Inc.*, 199 F.3d 1295, 1299, 53 USPQ2d 1065, 1067 (Fed. Cir. 1999)("[W]ords in patent claims are given their ordinary

meaning in the usage of the field of the invention, unless the text of the patent makes clear that a word was used with a special meaning."). See also< *In re Sneed,* 710 F.2d 1544, 218 USPQ 385 (Fed. Cir. 1983) *In re Barr,* 444 F.2d 588, 597, 170 USPQ 330, 339 (CCPA 1971). However, the Appellants further submit that the claims are defined in the specification, using the plain meaning of the terms. Thus, Appellants submit that the Examiner is reading the claims too broadly when reaching the conclusion that Armstong anticipates the claimed invention. It is quite clear from the reading of Armstrong that no step of 'calculating a reliability factor' is performed. Thus, for at least this reason, independent claim1 is not anticipated by Armstrong.

**b). Armstrong fails to teach or suggest the step of "*... varying a frequency for sending keep-alive messages to the neighbor based upon the reliability factor...*"**

Claim 1 includes the step of "varying a frequency for sending keep-alive messages to the neighbor based upon the reliability factor..." In contrast, as cited above, Armstrong teaches only that neighbors are "routinely polled" for node status information, or "continuously" monitored at "regular link monitoring intervals (such as one second)..." No teaching or suggestion of varying the frequency of keep-alive messages in response to any reliability analysis performed by the node is either shown, suggested or inferred by Armstrong.

As best Appellants can ascertain, it would appear that the Examiner is reading Armstrong to indicate that the step of 'varying the frequency' involves either sending the CST or not sending the CST, depending upon whether the node is indicated as on-line. However, Armstrong in fact teaches that there is routine communication with the off-line nodes, in particular determining the status of the node. Armstrong explicitly states "..."... The monitor software

running in each on-line node is responsible for indicating that a node has changed node status … In the on-line nodes, the node monitor tasks *routinely poll all nodes listed as off-line in the CST… At each on-line node, during regular one minute polling intervals*, the node monitor task transmits a polling packet to each of the off-line nodes between itself and the on-line node… These unsolicited boomerang packets will be received by the packet manager task of the destination node if that node is on-line…" Thus, communication with the nodes, whether on-line or off-line, for the purposes of determining status is performed at regular intervals. Thus, Armstrong neither describes nor suggests the step of "varying the frequency of keep-alive messages" as recited in independent claim 1. Accordingly, for this reason as well, Armstrong does not anticipate claim 1.

Thus, for at least these reasons, Appellants request that that the rejection of claim 1 under 35 U.S.C. §102 be withdrawn, as Armstrong fails to teach or describe *every* limitation in the claim as required by law.

**2). Claim 2:**

Claim 2 recites the step of "…determining a reliability for the neighbor; and calculating the reliability factor based upon the reliability for the neighbor…" Accordingly, because Armstrong fails to describe or suggest the step of "calculating the reliability factor" as recited in claim 2, the rejection of claim 2 should be withdrawn.

**3). Claim 3:**

Claim 3 recites the step of " measuring a reliability of a communication link to the neighbor; and calculating the reliability factor based upon the reliability of the communication

link to the neighbor..." For at least the reason that Armstrong neither describes the step of "measuring" or of "calculating the reliability factor", the rejection of claim 3 should be withdrawn.

**4). Claims 4, 11 and 18:**

Claim 4 recites the steps of: "wherein calculating the reliability factor for communicating with the neighbor comprises determining a reliability for the neighbor , *measuring a reliability of a communication link to the neighbor*; assigning *a relative weight* to each of the reliability for the neighbor and the reliability of the communication link to the neighbor; *calculating the reliability factor* to be a weighted average of the reliability for the neighbor and the reliability of the communication link to the neighbor..." Claim 11 recites "... wherein the reliability calculation logic is operably coupled to determine a reliability for the neighbor, measure a reliability for a communication link to the neighbor, assign a relative weight to each of the reliability for the neighbor and the reliability for the communication link to the neighbor, and calculate the reliability factor to be a weighted average of the reliability of the neighbor and the reliability of the communication link to the neighbor..." Claim 18 recites limitations similar to claim 11.

Claims 4, 11 and 18 thus include numerous limitations that are not shown or suggested by Armstrong. As mentioned previously, Armstrong neither describes nor suggests the steps of "calculating a reliability factor" or "measuring reliability." In addition, no mention or suggestion is found in Armstrong for the step of "assigning a relative weight to each of the reliability for the neighbor and the reliability of the communication link to the neighbor' and "calculating the reliability factor to be a weighted average ..."

The Examiner appears to state, at page 6 of the office action, that Armstrong teaches the steps of 'calculating the reliability factor to be a weighted average of the reliability for the neighbor and the reliability of the communication link…' at col. 11, line 12-34 and col. 2 to col. 3 line 48. However, the portions of text cited by the Examiner fail to teach these limitations.

In col. 11, lines 12-34, Armstrong describes a voting procedure for Intermittent Links. The text states:

> "… The distributed network monitoring system uses a voting procedure to identify intermittent communication links between network nodes. As a result of the voting procedure, each node operates with an identical list of intermittent links, providing such information to the communications driver to control the routing of messages over the network.
>
> An intermittent link is a link between nodes that, while still operational, has suffered a degradation in performance according to predetermined statistical criteria based on the ratio of errors and attempts for such link. For example, eternet systems commonly assign intermittent link conditions to node links that have an error rate in excess of one error per ten attempts. All such designations are on a node by node basis since many failure modes will be localized to a single node.
>
> The distributed network monitor system is capable of identifying intermittent links, and reporting them to the communication drivers in each node such that they can automatically use other links in routing messages to a particular node. If possible, the communications driver will route a message through a bridge node to avoid using an intermittent link. However, the intermittent link can still be used if no other link is available…"

Armstrong further states, at col. 11, lines 49-51:

"The CST circulates through the on-line nodes, and the CST servicer task in each node votes by setting appropriate bits in the Votes Tab le and Voters Table in the CST. Each node votes on the performance of the link under consideration…"

At column 13, lines 12-15, Armstrong describes:

"… When the voting procedure results in an indeterminate vote … nodes other than these involved … are used to produce more data for the following vote… When an indeterminate condition for a link between two nodes is detected by a CST servicer task … it instructs the node monitor task to send boomerang messages to node with intermediate link condition each second until the next vote takes place…"

Column 2 line 63 – column 3 describes only:

> "... The status information about each node contained in the CST includes condensed node status ... and network link status ... for each link. In addition, each node stores information about the condition of links in the network system, and in particular about links that are in an intermittent condition... Intermittent link conditions are determined by voting ... If enough votes to make a determination about whether the condition of any link for any node is intermittent are not available, such link is indicated to have an indeterminate link condition...."

Thus, the portions of text cited by the Examiner appear to describe a technique that is used in Armstrong to determine whether a link is intermittent. However, the claim language of claim 4 recites the steps of "...assigning *a relative weight* to each of the reliability for the neighbor and the reliability of the communication link to the neighbor; *calculating the reliability factor* to be a weighted average of the reliability for the neighbor and the reliability of the communication link to the neighbor..." No such description or suggestion of these steps is found in any portion of the text. In addition, it should be noted that the voting procedure of Armstrong does *not* in any way alter the frequency with which the CST table is forwarded through the system, as the reliability factor of the present invention is used to alter the frequency for sending keep alive messages.

Accordingly, for the reason that Armstrong fails to teach several limitations of the claims, the rejection of claims 4, 11 and 18 under 35 U.S.C. §102 is improper and should be withdrawn.

**5). Claims 5, 12 and 19:**

Claim 5 includes the steps of "... wherein varying the frequency for sending keep-alive messages to the neighbor based upon the reliability comprises ... setting the frequency for sending keep-alive messages to the neighbor in inverse proportion to the reliability factor..." Claims 12 and 19 recite "...wherein the frequency variation logic is operably coupled to set the

frequency for sending keep-alive messages to the neighbor in inverse proportion to the reliability factor…"

Because Armstrong fails to disclose a reliability factor, it follows that Armstrong neither describes nor suggests the step of 'setting the frequency for sending keep-alive messages to the neighbor in inverse proportion to the reliability factor…' For at least this reason, the rejection of claims 5, 12 and 19 under 35 U.S.C. §102 is improper and should be withdrawn.

**6). Claims 6, 13 and 20:**

Claim 6 recites the steps of "… updating the reliability factor; and adjusting the frequency for sending keep-alive messages to the neighbor based upon the reliability factor. Claims 13 and 20 recite "wherein the reliability calculation logic is operably coupled to update the reliability factor, and wherein the frequency variation logic is operably coupled to adjust the frequency for sending keep-alive messages to the neighbor based upon the updated reliability factor…"

Because Armstrong fails to disclose a reliability factor, it follows that Armstrong neither describes nor suggests the step of updating the reliability factor…' For at least this reason, the rejection of claims 5, 13 and 20 under 35 U.S.C. §102 is improper and should be withdrawn.

**7). Claims 7, 14 and 21:**

Claim 7 recites "… wherein adjusting the frequency for sending keep-alive messages to the neighbor comprises reducing the frequency for sending keep-alive messages to the neighbor, if the updated reliability factor represents a reliability improvement for communicating with the neighbor; and increasing the frequency for sending keep-alive messages to the neighbor, if the

updated reliability factor represents a reliability degradation for communicating with the neighbor…" Claims 14 and 21 recite a similar limitation. Because Armstrong fails to disclose a reliability factor, it follows that Armstrong neither describes nor suggests the step of updating the reliability factor and adjusting the frequency according to the updated reliability factor. For at least this reason, the rejection of claim 7, 14 and 21 under 35 U.S.C. §102 is improper and should be withdrawn.

**8). Claims 8, 15 and 22:**

Independent claim 8 recites "… A device for sending keep-alive message to a neighbor in a communication network, the device comprising reliability calculation logic operably coupled to periodically calculate a reliability factor for communicating with the neighbor; and frequency variation logic responsive to the reliability calculation logic and operably coupled to calculate a frequency for sending keep-alive messages to the neighbor based upon the reliability factor…"

Independent claim 15 recites "…A program product comprising a computer readable medium having embodied thereon a computer program for sending keep-alive messages to a neighbor in a communication network, the computer program comprising reliability calculation logic operably coupled to periodically calculate a reliability factor for communicating with the neighbor; and frequency variation logic responsive to the reliability calculation logic and operably coupled to determine a frequency for sending keep-alive messages to the neighbor based upon the reliability factor…"

Independent claim 22 recites "…A communication system comprising a plurality of interconnected devices including a node and a neighbor in communication over a link, wherein the node is operably coupled to send keep-alive messages to the neighbor, and wherein the node

is operably coupled to vary the frequency for sending keep-alive messages to the neighbor based upon a periodically computed reliability factor for communicating with the neighbor over the communication link…"

Appellants assert that claims 8, 15 and 22 are patentably distinct over Armstrong, for at least the reasons that Armstrong fails to describe or suggest 1). reliability calculation logic operably coupled to periodically calculate a reliability factor and 2). frequency variation logic responsive to reliability calculation logic…" No such structure is described or suggested by Armstrong. As described with regard to claim 1, it appears that the Examiner has not given patentable weight to the language of the claims, which Appellant clearly believe distinguishes over Armstrong. For at least this reason, Appellant requests that the rejection under 35 U.S.C. §102 of claims 8 and 15 be withdrawn.

**9). Claims 9, 10, 16, 17, 23 and 24 :**

Claim 9 recites "… wherein the reliability calculation logic is operably coupled to determine a reliability for the neighbor and calculate the reliability factor based upon the reliability for the neighbor…" Claim 10 recites "… wherein the reliability calculation logic is operably coupled to determine a reliability for a communication link to the neighbor and determine the reliability factor based upon the reliability for the communication link to the neighbor…." Claim 16 recites "… wherein the reliability calculation logic is programmed to determine a reliability for the neighbor and calculate the reliability factor based upon the reliability for the neighbor…" Claims 17 recites "… wherein the reliability calculation logic is programmed to measure a reliability for a communication link to the neighbor and

calculate the reliability factor based upon the reliability for the communication link to the neighbor…" Claim 23 recites limitations similar in scope to claims 9 and 16, and claim 24 recites limitations similar in scope to claims 10 and 17.

As mentioned previously, no mention or suggestion is provided in Armstrong of a 'reliability factor', and accordingly the rejections of claims 9, 10, 16, 17, 23 and 24 under 35 U.S.C. §102 are improper should be withdrawn.

**10). Claims 25 and 26:**

Claims 25 and 26 recite "…wherein the reliability factor (RF) is calculated using the below equation, where A is the measured reliability of the communication link to the neighbor, B is the determined reliability of the neighbor, W1 is a relative weight for A and W2 is a relative weight for B:

$$RF = (W1*A + W2*B)\ldots\text{"}$$

No such equation is described or suggested in Armstrong. For at least the reason that Armstrong fails to suggest every limitation of the claims as required by 35 U.S.C. §102, the rejection under 102 of claims 25 and 26 is improper and should be withdrawn.

## IX. Conclusion

Appellant submits therefore that the rejection of claims 1-26 under 35 U.S.C. § 102 is improper for failing to describe or suggest every elements of the claims. Appellants therefore request that the rejections be withdrawn and the case be put forward for allowance.

Respectfully submitted,

NORTEL NETWORKS LTD.

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## *APPENDIX A*

## CLAIMS

1. (previously presented) A method for sending keep-alive messages by a node to a neighbor in a communication network, the method comprising:

periodically calculating a reliability factor for communicating with a neighbor; and

varying a frequency for sending keep-alive messages to the neighbor based upon the reliability factor.

2. (previously presented) The method of claim 1, wherein calculating the reliability factor for communicating with the neighbor comprises:

determining a reliability for the neighbor; and

calculating the reliability factor based upon the reliability for the neighbor.

3. (previously presented) The method of claim 1, wherein calculating the reliability factor for communicating with the neighbor comprises:

measuring a reliability of a communication link to the neighbor; and

calculating the reliability factor based upon the reliability of the communication link to the neighbor.

4. (previously presented) The method of claim 1, wherein calculating the reliability factor for communicating with the neighbor comprises:

determining a reliability for the neighbor;

measuring a reliability of a communication link to the neighbor;

assigning a relative weight to each of the reliability for the neighbor and the reliability of the communication link to the neighbor;

calculating the reliability factor to be a weighted average of the reliability for the neighbor and the reliability of the communication link to the neighbor.

5. (previously presented) The method of claim 1, wherein varying the frequency for sending keep-alive messages to the neighbor based upon the reliability comprises:

setting the frequency for sending keep-alive messages to the neighbor in inverse proportion to the reliability factor.

6. (Original) The method of claim 1, further comprising:

updating the reliability factor; and

adjusting the frequency for sending keep-alive messages to the neighbor based upon the reliability factor.

7. (Original) The method of claim 6, wherein adjusting the frequency for sending keep-alive messages to the neighbor comprises:

reducing the frequency for sending keep-alive messages to the neighbor, if the updated reliability factor represents a reliability improvement for communicating with the neighbor; and

increasing the frequency for sending keep-alive messages to the neighbor, if the updated reliability factor represents a reliability degradation for communicating with the neighbor.

8. (previously presented) A device for sending keep-alive message to a neighbor in a communication network, the device comprising:

reliability calculation logic operably coupled to periodically calculate a reliability factor for communicating with the neighbor; and

frequency variation logic responsive to the reliability calculation logic and operably coupled to calculate a frequency for sending keep-alive messages to the neighbor based upon the reliability factor.

9. (previously presented) The device of claim 8, wherein the reliability calculation logic is operably coupled to determine a reliability for the neighbor and calculate the reliability factor based upon the reliability for the neighbor.

10. (previously presented) The device of claim 8, wherein the reliability calculation logic is operably coupled to determine a reliability for a communication link to the neighbor and determine the reliability factor based upon the reliability for the communication link to the neighbor.

11. (previously presented) The device of claim 8, wherein the reliability calculation logic is operably coupled to determine a reliability for the neighbor, measure a reliability for a communication link to the neighbor, assign a relative weight to each of the reliability for the neighbor and the reliability for the communication link to the neighbor, and calculate the reliability factor to be a weighted average of the reliability of the neighbor and the reliability of the communication link to the neighbor.

12. (previously presented) The device of claim 8, wherein the frequency variation logic is operably coupled to set the frequency for sending keep-alive messages to the neighbor in inverse proportion to the reliability factor.

13. (previously presented) The device of claim 8, wherein the reliability calculation logic is operably coupled to update the reliability factor, and wherein the frequency variation logic is operably coupled to adjust the frequency for sending keep-alive messages to the neighbor based upon the updated reliability factor.

14. (previously presented) The device of claim 13, wherein the frequency variation logic is operably coupled to reduce the frequency for sending keep alive messages to the neighbor if the updated reliability factor represents a reliability improvement for communicating with the neighbor and increase the frequency for sending keep-alive messages to the neighbor if the updated reliability factor represents a degradation for communicating with the neighbor.

15. (previously presented) A program product comprising a computer readable medium having embodied thereon a computer program for sending keep-alive messages to a neighbor in a communication network, the computer program comprising:

reliability calculation logic operably coupled to periodically calculate a reliability factor for communicating with the neighbor; and

frequency variation logic responsive to the reliability calculation logic and operably coupled to determine a frequency for sending keep-alive messages to the neighbor based upon the reliability factor.

16. (previously presented) The program product of claim 15, wherein the reliability calculation logic is programmed to determine a reliability for the neighbor and calculate the reliability factor based upon the reliability for the neighbor.

17. (previously presented) The program product of claim 15, wherein the reliability calculation logic is programmed to measure a reliability for a communication link to the neighbor and calculate the reliability factor based upon the reliability for the communication link to the neighbor

18. (previously presented) The program product of claim 15, wherein the reliability calculation logic is programmed to determine a reliability for the neighbor, measure a reliability for a communication link to the neighbor, assign a relative weight to each of the reliability for the neighbor and the reliability for the communication link to the neighbor, and calculate the reliability factor to be a weighted average of the reliability of the neighbor and the reliability of the communication link to the neighbor.

19. (previously presented) The program product of claim 15, wherein the frequency variation logic is programmed to set the frequency for sending keep-alive messages to the neighbor in inverse proportion to the reliability factor.

20. (previously presented) The program product of claim 15, wherein the reliability calculation logic is programmed to update the reliability factor, and wherein the frequency variation logic is operably coupled to adjust the frequency for sending keep-alive messages to the neighbor based upon the updated reliability factor.

21. (previously presented) The program product of claim 15, wherein the frequency variation logic is programmed to reduce the frequency for sending keep alive messages to the neighbor if the updated reliability factor represents a reliability improvement for communicating with the neighbor and increase the frequency for sending keep-alive messages to the neighbor if the updated reliability factor represents a degradation for communicating with the neighbor.

22. (previously presented) A communication system comprising a plurality of interconnected devices including a node and a neighbor in communication over a link, wherein the node is operably coupled to send keep-alive messages to the neighbor, and wherein the node is operably coupled to vary the frequency for sending keep-alive messages to the neighbor based upon a periodically computed reliability factor for communicating with the neighbor over the communication link.

23. (previously presented) The communication system of claim 22, wherein the node is operably coupled to calculate the reliability factor based upon a reliability for the neighbor and a measured reliability for the communication link.

24. (previously presented) The communication system of claim 22, wherein the node is operably coupled to set the frequency for sending keep-alive messages to the neighbor in inverse proportion to the reliability factor.

25. (Previously Presented) The method of claim 4, wherein the reliability factor (RF) is calculated using the below equation, where A is the measured reliability of the communication link to the neighbor, B is the determined reliability of the neighbor, W1 is a relative weight for A and W2 is a relative weight for B:

$$RF = (W1*A + W2*B).$$

26. (Previously Presented) The device of claim 11, wherein the reliability factor (RF) is calculated using the below equation, where A is the measured reliability of the communication link to the neighbor, B is the determined reliability of the neighbor, W1 is a relative weight for A and W2 is a relative weight for B:

$$RF = (W1*A + W2*B).$$